May 21st, 5:30 PM - 8:00 PM

Mathematical Modeling of Endotoxin-Induced Inflammation in Young Men

Renee Brady
North Carolina State University at Raleigh, rbrady@ncsu.edu

Title: Mathematical Modeling of Endotoxin-Induced Inflammatory Response in Young Men.

Authors: Renee Brady[1], Dennis O. Frank-Ito[2], Hien T. Tran[1], Susanne Janum[3], Susanne Brix[4], Johnny T. Ottesen[5], Jesper Mehlsen[3], and Mette S. Olufsen[1]

[1]*Department of Mathematics, North Carolina State University, Raleigh, NC,*

[2]*Departments of Surgery, Duke University Medical Center, Durham, NC,*

[3]*Coordinating Research Centre, Frederiksberg Hospital, Frederiksberg, Denmark*

[4]*Department of Systems Biology, Technical University of Denmark, Lyngby, Denmark*

[5]*Department of Science, Systems, and Models, Roskilde University, Roskilde, Denmark*

Renee Brady, NCSU Department of Mathematics, Box 8205, Raleigh, NC 27695, Email: rbrady@ncsu.edu, Tel: (919) 515-0679

Abstract

ABSTRACT – The initial reaction of the body to bacterial infection or severe tissue trauma is an acute inflammatory response. The magnitude of an acute inflammatory response is of critical importance in evaluating patients during early postoperative mobilization. Uncontrolled inflammation can cause further tissue damage, while insufficient inflammation can result in immunodeficiency. An uncontrolled inflammatory response can cause further tissue damage, while an insufficient response can result in immunodeficiency. A normal inflammatory response helps to annihilate the threat posed by bacterial pathogens, such as endotoxin and thus, restore the body to a healthy state. Here, we present a mathematical model incorporating key components of the inflammatory response in humans. Our model was calibrated to experimental data obtained from experiments measuring pro-inflammatory cytokines (IL-6, IL-8, and TNF) and the anti-inflammatory cytokine IL-10 over 8 hours in 20 healthy men. Each partcipant was given a low dose of lipopolysaccharide (LPS), an endotoxin stimulating inflammation.